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Principles of Fatigue in Residency Education: A Qualitative Study

Taryn S. Taylor MD, Christopher J. Watling MD PhD, Pim W. Teunissen MD PhD, Tim Dornan MD PhD, and Lorelei Lingard PhD

Dr. Taylor is resident Department of Obstetrics & Gynaecology, and research fellow Centre for Education Research & Innovation, Schulich School of Medicine & Dentistry, Western University, London, Ontario, Canada. Email: ttaylor2010@meds.uwo.ca

Dr. Watling is associate dean, Postgraduate Medical Education, Schulich School of Medicine & Dentistry, Western University, London, Ontario, Canada.

Dr. Teunissen is associate professor of medical education at Maastricht University, the Netherlands and gynaecologist at the Department of Obstetrics & Gynaecology, VU University Medical Center, Amsterdam, the Netherlands

Dr. Dornan is professor of Medical and Interprofessional Education, Centre for Medical Education, Whitla Medical Building, Queen's University Belfast, Northern Ireland and Emeritus Professor, Maastricht University, PO Box 616, 6200 MD Maastricht, the Netherlands

Dr. Lingard is professor of Medicine, senior scientist and director Centre for Education Research & Innovation, Schulich School of Medicine & Dentistry, and professor Faculty of Education, Western University, London, Ontario, Canada.

Corresponding author:

Dr. T. Taylor

Centre for Education Research & Innovation

Health Sciences Addition Room 110

Schulich School of Medicine & Dentistry, Western University

London, Ontario, Canada, N6A 5C1

1-519-661-2111 x 89044

Email: ttaylor2010@meds.uwo.ca

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Abstract

Principles of Fatigue in Residency Education

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Background

Recent proposals to implement fatigue management strategies in residency education assume that medicine shares the view of other risk-adverse industries that fatigue is hazardous. This view is an essential underpinning of fatigue management strategies that other industries have embedded as part of their workplace occupational health and safety programs. This study sought to explore whether medicine shares this view, by asking how residents understand fatigue in the context of their training environment.

Methods

We interviewed 21 residents across 6 surgical and non-surgical programs, at one Canadian medical school in 2014. All participants met the inclusion criteria of routinely working 24h call shifts while enrolled in their training program. Data collection and analysis occurred iteratively in keeping with constructivist grounded theory methodology, and informed theoretical sampling to sufficiency.

Results

Four predominant principles of fatigue captured how the social learning environment shaped residents' perceptions of fatigue. These included the conceptualization of fatigue as: (1)

inescapable and therefore accepted, (2) manageable through experience, (3) necessary for future practice and (4) surmountable when required.

Interpretation

This study elaborates our understanding of how principles of fatigue are constructed and reinforced by the training environment. Whereas fatigue is seen as a collective hazard in other industries, our data show that, in residency training, fatigue may be seen as a personal challenge. Consequently, fatigue management strategies that conceptualize fatigue as an occupational threat may have limited impact on resident behavior and patient safety.

Introduction

Emerging research has suggested that resident duty hour restrictions may have done more harm than good [1-4]. In Canada, the National Steering Committee on Resident Duty Hours proposed fatigue management strategies as a promising alternative to prescriptive "one size-fits-all" resident duty hour restrictions [5, 6]. The final report advocated for new accreditation standards which would require residency programs to "develop, and keep up to date, fatigue risk management plans" [5, 6]. Empirical evidence supports the notion that prolonged sleep deprivation leads to performance impairment [7-10] and fatigue management strategies would fulfill a need to maintain public accountability in the absence of duty-hour legislation. However, as Pattani and colleagues note, this mandate lacks important details about the design and implementation of fatigue management strategies [6].

Unlike the explicit policies that limit resident duty hours in other countries, there is no model for fatigue management strategies in medical education, and research about effectively managing fatigue in residency contexts is scarce. Arora et al found that an educational seminar to improve sleep hygiene practices had minimal impact on residents' behaviour [11]. Policies of protected sleep time during prolonged duty periods have shown inconsistent results [12, 13]. Additional studies have highlighted how the influence of local training culture can trump duty hour policy [14] and alter perceptions of the impact of sleep deprivation [15]. These varied perceptions and cultural influences have received little attention to date amid discussions of anticipated fatigue management strategies.

In other industries, such as transportation, aviation and the military, fatigue management strategies benefit from a uniform understanding of fatigue as an occupational threat [16]. The fact that residents and faculty hold varied perceptions about the impact of fatigue on clinical performance, particularly within surgical contexts, suggests that fatigue may

not be quite so straightforwardly understood in residency training [15, 17]. Until we know more about how fatigue is understood in residency training across multiple disciplines, we risk developing fatigue management strategies that are irrelevant and fail to address the existing shortcomings of duty hour restrictions. Thus, this study seeks to explore how residents understand fatigue in the context of their training environment.

Methods

We used a constructivist grounded theory approach, which is suitable for socially situated research questions [18].

Participant Selection and Setting

We conducted 21 individual, semi-structured interviews at three hospitals within a single academic training centre with radiology, psychiatry, critical care, general surgery, pediatrics, internal medicine, and orthopedic surgery residents. We deliberately sampled across these programs because the nature of residents' on-call work varied and we wanted to include programs that have had limited representation in the existing duty hours literature. All participants were routinely scheduled to work 24h call shifts, as per our inclusion criteria.

Recruitment

Recruitment, data collection and analysis took place between December 2013 and June 2014. Recruitment involved email and face-to-face invitations approved by each program director. In keeping with constructivist grounded theory methodology, we progressed from convenience to purposive and then theoretical sampling to sufficiency [19].

Data Collection

One co-investigator (TT - a resident at one of the hospitals) conducted 20/21 interviews in person or over the phone at the participant's convenience, often at the hospital. A co-

investigator (LL – a non-clinician scientist) deliberately conducted one interview for the purposes of rigor, to ensure that TT's identity as a resident did not have a substantial impact on the information that participants chose to disclose during the open-ended interviews [20]. To remain reflexively aware of how her insider experience informed the analysis, TT made regular memos and co-analyzed with non-insider members of the research team [18, 21]].

Analysis

Analyzed data included transcripts of the audio-recorded interviews, alongside field notes and analytical memos written by TT. We followed the iterative process of data collection and analysis, which is characteristic of constructivist grounded theory [18]. This required revisions of the semi-structured interview guide (Appendix) in response to progressive refinement of the emerging theory. We chose not to confine the interviews to any specific definition of fatigue (e.g. physiological, cognitive, emotional, chronic, acute, etc.) to allow for a more inclusive representation of fatigue.

We began our analysis with initial grounded theory coding with gerunds, followed by constant comparative analysis, which led to a more conceptual coding framework [18]. Further refinement of this framework through collaborative analysis amongst co-investigators (TT, LL, PT, TD, CW) resulted in the final emergent theory. NVivo® qualitative analysis software and MindNode Pro®, a mind-mapping tool, were used to organize the coding process.

Ethics Approval

We obtained research ethics approval from the institutional research ethics board at Western University (#102769) Informed consent was obtained in writing from each participant.

Results

Twenty-one participants were sampled from a range of postgraduate years (1-7) and included 13 male residents, 12 married residents, 6 residents with children and 13 senior-level residents, as defined by the individual programs.

Residents referred to various features of their training environment that informed how they recognized, discussed, and responded to fatigue in the context of residency training. Residents reported that "recognizing that you are tired" was always in tension with "also recognizing that there is a job to be done" (018). In fact, some perceived that a goal of wellness was incompatible with the training they had chosen: "I am in this not to … how do I put it correctly? Not for wellness … I would have picked a different career. I'm in here to become a good doctor. The best way I can do that is to spend the hours seeing the things that need to be seen." (005) Such reflections suggest that understandings of fatigue were socially informed by tacit messaging and normative expectations about what residency is about.

Four "principles of fatigue" captured these socially informed ways in which residents made sense of fatigue. Fatigue was seen as: (1) inescapable and therefore accepted, (2) manageable through experience, (3) necessary for future practice, and (4) surmountable when required. Each principle is described below and illustrated with salient quotations from the interviews, which are provided in Table 1.

According to the principle of fatigue being inescapable and therefore accepted, fatigue is so pervasive that it is simply part of the job. Senior residents were predominant among those who endorsed the notion that fatigue is manageable through experience; they suggested that working while sleep deprived was a skill to be honed with practice. The principle that fatigue is necessary for future practice meant that working while fatigued was a valuable rite of passage to prepare for similar realities after residency. Residents across all sampled programs

reinforced the idea that fatigue is surmountable when required, by suggesting that they could willfully persevere and continue to function in spite of fatigue.

The principle that fatigue is surmountable when required warrants further elaboration because it was prominent in participants' responses and is relevant to the concept of fatigue management. For many residents, fatigue was simply another challenge to overcome: "I think as long as you can stand up and stay awake and physically manage, then you can usually force your brain to work, even if it is harder to do and you may be more prone to mistakes…" (017) Surmounting fatigue wasn't always presented as onerous. At times, participants implied that it was a natural response to workplace demands: "Usually when the volume is high and you know you have that pressure, it's almost like there's so much adrenaline, that I don't really feel as fatigued at that point" (010).

While most residents agreed that fatigue would not stand in the way of doing what needed to be done, the principle of surmounting fatigue was not necessarily synonymous with providing high quality care. One resident reflected on this by saying, "Obviously we say we think we are doing a good job. But I think, maybe, you are just a little bit slower, less efficient. You could get things done faster and maybe more safely if people weren't as tired." (015) Various strategies within the workplace environment allowed participants to "push through" (018) in spite of fatigue. They described "filtering more to critical versus non-critical issues" (005), relying on "little check boxes" to remember details (017), delegating tasks amongst team members to "distribute the workload" when feasible (014), and going "into auto pilot" mode (010). Residents frequently spoke about how fatigue affected their mood and interactions with others: "I think we can all agree that the more fatigued we are, the more likely we are to have our social skills compromised." (010) This resident explained how the impact of fatigue on communication was perceived as advantageous in some circumstances: "I'm probably less

articulate on a post-call breaking bad news but at the same time, I'll just slow down and it may seem like I'm more empathetic…which is really just because I'm having a hard time coming up with the words" (007)

In keeping with the principle that fatigue is surmountable when required, few residents directly attributed near misses or medical errors to fatigue. Residents' comments suggested that they typically needed to have negative outcomes drawn to their attention before they would attribute them to fatigue: "Until it was obvious that I was making technical mistakes, I probably wouldn't recognize it."(013) It seemed that fatigue was not a legitimate reason for making mistakes because it was deemed surmountable: " You know, being tired might be a valid excuse to put things off that can wait, but it's not an acceptable excuse for poor decision making. At least not in the medical culture, I think." (006)

Some residents pointed to systems-based limitations that implied that surmounting fatigue was something they felt "forced to do" (008). For instance, one resident commented on the lack of "resources in place for staff physicians to be able to say, 'hey I am tired today'…our groups aren't built that way… your colleagues will have to pick up the slack and you can't call in a substitute like you might in another profession."(003) Thus, residents' workplace learning environments reinforced the idea that it is both necessary and plausible to "tough it out" (003) and overcome the effects of fatigue.

There were discrepancies across these four principles, where residents either challenged the prevailing principle or offered a variation. One questioned how the pervasiveness of fatigue has remained acceptable in medical training: "But at what point do we become where that is okay? Because in other professions, it is not okay, so pilots or truck drivers… (018) A few residents disputed the idea that fatigue served a training purpose: "I don't believe we need to train people to perform well when we're tired…." (013) There were a

few, typically extreme, scenarios in which residents described insurmountable fatigue. This resident recalled a time when his attending physician, as he put it, "pulled the parachute and left" (020):

> [My staff] operated all day and then he was on call with me all night and operated and then the next day he operated all day… I think it was 42 hours straight in the operating room… He called another staff to help finish the [last] case for him because he couldn't go on anymore. He was pooched… (020)

By pushing the limits of these socially-accepted principles of fatigue, residents were reinforcing the existence of these principles while questioning their merit in the training environment.

Interpretation

Main Findings

Our study describes 4 principles of fatigue that residents use to make sense of fatigue within the training environment: fatigue is understood as inescapable, manageable, necessary and surmountable. These principles are more than individual beliefs; they seem to be deeply engrained in the local training culture. And they reveal three serious problems, which must be faced before we can ensure the successful design and implementation of fatigue management strategies in residency education.

Explanation and Comparison with Other Studies

~~Principles or Myths?~~

The first problem is that these principles of fatigue have been discredited as 'myths' in other high performance industries such as aviation and transportation [22]. There are both regulatory and organizational reasons for why these industries have outgrown the principles of fatigue that residents in our study subscribe to. At a regulatory level, fatigue was first

legitimized as a safety priority during a Department of Transportation/Federal Highway Administration Safety Summit twenty years ago [22]. Since then, high profile disasters such as "the Chernobyl nuclear reactor meltdown, the Exxon Valdez catastrophe, the Three Mile Island nuclear power station accident..." have clearly implicated fatigue as a "causal or contributory factor" [23].Therefore, organizations that fail to implement sufficient fatigue management systems are liable to be found "criminally negligent in the event of an on-the-job mishap"[22]. Public visibility may be one distinguishing feature that has prompted other industries to adopt the stance that fatigue is an occupational safety threat, which in turn supports an explicit and formalized approach to fatigue management. By contrast, the consequences of fatigued residents are generally less public, with fewer casualties per fatigue-related incident, enabling continued skepticism in medical education about whether fatigue is dangerous in residency training [24].

~~Challenge or Threat?~~

The second problem is that the principles revealed in our study characterize fatigue not as a threat, but as a challenge. Previous research has shown that surgical residents believe themselves to be resilient to the effects of sleep deprivation [15] and that general surgery residents and faculty believe fatigue is irrelevant to patient care [17]. Our research suggests that this belief may permeate residency more broadly. Even residents who perceived that their performance was negatively affected by fatigue nevertheless believed there had been no meaningful impact on patient care. In addition to not seeing fatigue as a threat, our participants perceived it as a challenge: the ability to keep working while fatigued was presented as a necessary skill. One implication of this is that the responsibility for this skill lies

primarily with the resident. This is in stark contrast to other industries, such as transportation and aviation [25], that approach fatigue as a collective threat, not as a personal challenge.

~~Persevere or …?~~

The third problem is that residents cannot be expected to view fatigue as a threat when the working environment presents no acceptable alternative to working fatigued. Residents noted that there weren't any explicit provisions for addressing fatigue in the workplace, although there were established conventions for dealing with overwhelming patient volume, clinical uncertainty or procedural supervision. Studies of residency as a workplace training environment have shown that the workplace can implicitly preserve the status quo [26]. As our data demonstrated, the unspoken message from the training environment was that fatigue must be surmountable, because it could not be helped.

Limitations

We conducted this research using a constructivist grounded theory methodology. This methodology is not intended to create a generalizable theory but, rather, to offer in-depth insight into a social phenomenon within a given context. We performed this research at a single centre and the local training culture necessarily informs our results. Further research that explores and elaborates our emergent theory in other contexts is needed. We relied on individual residents' account of experiencing fatigue rather than an objective measurement of fatigue because our research question was focused on their understanding. Consequently, this study does not quantify the prevalence of fatigue or attempt to measure its impact on patient care. We benefitted from having an insider (TT) who could provide analytical insights that were accessible to someone with lived experience [21] as part of the research team. TT

followed standard techniques for attending to her insider role throughout the analytical process [18, 21].

Conclusions and Implications for Practice and Future Research

The success of fatigue management strategies in other industries is based on the assumption that fatigue is uniformly understood as an occupational threat. Our results suggest that this assumption does not hold in residency. Under present conditions, the implementation of fatigue management strategies in residency training may not have a significant impact on resident fatigue or patient safety. Future research that explores whether existing principles of fatigue can be altered by changes within the training environment could bring us closer to successfully implementing effective fatigue management strategies.

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